EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 2-06

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-12-060	09/30/2012 To 09/29/2015 Base Option Period Number 2	Coral Reefs/Changing Climate

Contractor: TETRA TECH, INC.

Specify Section and paragraph of Contract SOW: 2e

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 09/30/2014 To 09/29/2015

Comments:

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

SFO (Max 2): ☐

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
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Authorized Work Assignment Ceiling

Contract Period:	Cost/Fee:	LOE:
09/30/2012 To 09/29/2015		
This Action:		
Total:		

Work Plan / Cost Estimate Approvals

Contractor WP Dated:	Cost/Fee:	LOE:
Cumulative Approved:	Cost/Fee:	LOE:

Work Assignment Manager Name: Jordan West (Signature) (Date)	Branch/Mail Code: Phone Number: 703-347-8584 FAX Number:
Project Officer Name: Sharon Boyde (Signature) (Date)	Branch/Mail Code: Phone Number: 703-347-8576 FAX Number: 703-374-8696
Other Agency Official Name (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Mark Cranley (Signature) 09/12/14 (Date)	Branch/Mail Code: CPOD Phone Number: 513-487-2351 FAX Number: 513-487-2109

Performance Work Statement

Tetra Tech, Inc.
Contract EP-C-12-060
Work Assignment No. 2-06

TITLE: Adaptation Planning for Coral Reefs in a Changing Climate

PERIOD OF PERFORMANCE: Award date through September 29, 2015

WORK ASSIGNMENT MANAGER: Jordan West
Global Change Research Program
US Environmental Protection Agency
1200 Pennsylvania Ave., NW (8601P)
Washington, DC 20460
west.jordan@epa.gov
703-347-8584 (voice)
703-347-8694 (fax)

ALTERNATE WAM : Susan Julius
Global Change Research Program
US Environmental Protection Agency
1200 Pennsylvania Ave., NW (8601P)
Washington, DC 20460
julius.susan@epa.gov
703-347-8619 (voice)
703-347-8694 (fax)

Work Assignment 1-06 is a crossover work assignment. Tasks 6 thru 9a will have been completed during Option Period 1 of the contract. Tasks 9b thru 11 will be completed during Option Period 2 of the contract.

INTRODUCTION

Work in EPA's Global Change Impacts and Adaptation (GCIA) Program involves assessments of the potential vulnerability to climate change (and other global change stressors such as land-use change) of ecosystem health, water quality, human health and air quality with a focus on developing adaptation options to build resilience in the face of these vulnerabilities. Vulnerability and adaptation assessment activities in the GCIA aquatic ecosystems focus area support EPA's mission and responsibilities as defined by the Clean Water Act (CWA) and are designed to build the capacity of EPA programs, regional offices, aquatic ecosystem managers (including coral reef managers), and other decision-makers to assess and respond to global change impacts on ecosystem processes and services. The purpose of this work assignment is to provide technical support to the GCIA Program and partners to advance frameworks and methods for adaptation planning for coral reef ecosystems.

Multiple recent efforts across government, non-governmental organizations, and academia have

advanced the dialogue on general principles for adaptation to climate change at the national scale (e.g., National Ocean Policy Strategic Action Plan, National Wildlife, Fish & Plants Climate Adaptation Strategy); for particular management systems (e.g., NOAA Climate Smart Sanctuaries framework); and from an ecosystem/conservation perspective (e.g., EcoAdapt's Climate Savvy guide). While these efforts provide critical, general theoretical underpinnings for adaptation planning, there is a need to marry these top-down principles with emerging work on bottom-up adaptation planning by actual practitioners, in order to connect the theoretical to the practical.

EPA participated in a Climate Smart Work Group convened by the National Wildlife Federation to develop a unified adaptation framework designed to be tractable and accessible for use by ecosystem managers. Case study applications of this type of framework, in combination with other approaches being experimented with on the ground, are needed in order to demonstrate utility for specific vulnerable ecosystems such as coral reefs. Thus the EPA GCIA Program -- in collaboration with EPA Region 9 and interagency members of the Climate Change Working Group of the U.S. Coral Reef Task Force -- is developing a framework and methodology for adaptation planning, informed by feedback gained from a stakeholder workshop that occurred in Honolulu slated in spring 2014. At the 2.5 day workshop, expert managers and scientists from Federal agencies, states, territories, academia and non-governmental organizations provided feedback on a draft framework and methodology for identifying adaptation options as part of management planning, and called for greater development of evaluation methods explored at the workshop.

OBJECTIVES

Under this work assignment, the Contractor shall provide technical support for: literature/case study reviews; further revision of the adaptation framework and development of evaluation methods explored at the workshop; lessons-learned analysis; and a case study write-up for inclusion in a larger Reef Manager's Guide to Adaptation being developed in partnership with the National Oceanic and Atmospheric Administration and Australia's Great Barrier Reef Marine Park Authority. The objectives of the full project are to: (1) carry out a review and synthesis of frameworks and case studies in order to tailor existing frameworks specifically for use in coral reef adaptation planning; (2) present a draft framework and methods to coral reef stakeholders in the Pacific region for "testing" and critique through an expert elicitation exercise; (3) use stakeholder feedback along with additional literature/case study review as needed to revise the draft framework and methods; and (4) produce a case study write-up (in the form of a journal article, book chapter, or online report) on the framework, methods and lessons learned.

REQUIRED CONTRACTOR QUALIFICATIONS

1) Multidisciplinary professional expertise in assessing the impacts of climate change and other interacting stressors (such as land use change) on climate-sensitive ecosystems, including expertise in resilience and threshold theory and management adaptation.

2) Thorough knowledge of conceptual approaches, methods, trainings and on-the-ground work on climate change vulnerability assessment and adaptation planning applications for coral reef conservation and management, especially in the Pacific region and including knowledge of leading work on resilience and adaptation management focused on the Great Barrier Reef.

3) Experience developing and evaluating practical frameworks and trainings for integrating climate change considerations into management planning and building resilience into conservation.

4) Expertise in directed literature searches and synthetic analyses of available literature (including grey literature).

5) Experience designing and facilitating expert scientific workshops.

6) Experience preparing technical reports and papers written in clear, concise prose consistent with the standards of peer reviewed scientific literature.

SPECIFIC TASKS:

Tasks 6-9a:

These are expected to have been completed by the end of Option Period 1.

Task 9: Lessons Learned Memo and Revised Adaptation Planning Framework and Methods

Based on the results of the workshop, the Contractor shall produce a memo describing the workshop exercise results in the form of a "lessons learned" analysis. This then shall be used as the basis for performing any additional revisions to the adaptation planning framework for coral reef managers as well as further methods development and/or suggested changes for future workshop exercises, in preparation for publication.

Deliverable 9a: Workshop results/lessons learned memo **Completion in Sept 2014**

This memo will include the Contractor's plan for framework revision and for deeper development of the evaluation method explored at the stakeholder workshop. The Contractor shall organize a SC call for one week later to obtain feedback.

Deliverable 9b: Revised framework and methods **Due:** 12 weeks after 9a approved

A revision of the framework and the further-developed evaluation methods, along with accompanying narrative, will be prepared for presentation at the in person working meeting in early 2015 (see Deliverable 11a). The Contractor shall organize a SC call for one week later to obtain feedback.

Deliverable 9c: Final framework and methods **Due:** 12 weeks after Deliverable 11b

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Task 10: Manuscript

The Contractor shall prepare a manuscript in the form of a case study write-up, journal article, or book chapter as per instruction from the WAM. The manuscript shall be written in clear, concise prose consistent with the standards of peer-reviewed scientific literature.

Deliverable 10a: Draft annotated outline **Due:** 2 weeks after Deliverable 9b

The Contractor shall use the results of Deliverable 9b (revised framework and methods) to propose the structure and topical content of a case study write-up of the framework, methodology, and place-based application results. The Contractor shall organize a SC call for one week later to obtain feedback.

Deliverable 10b: Revised annotated outline **Due:** 2 weeks after 10a feedback

A revised annotated outline shall be presented at the in person working meeting (see Deliverable 11a) for discussion and finalization.

Deliverable 10c: Draft manuscript **Due:** 8 weeks after Deliverable 11c

The Contractor shall organize a SC call for one week later to obtain feedback.

Deliverable 10d: Revised manuscript **Due:** 8 weeks after 10c feedback

The Contractor shall organize a SC call for one week later to obtain feedback.

Deliverable 10e: Final manuscript **Due:** 4 weeks after 10d feedback

Task 11: In-Person Working Meeting of the Steering Committee

The Contractor shall assist the WAM in organizing and facilitating an in-person meeting of the SC in Washington, DC for 2 days in the spring of 2015. SC members are Federal and/or local and will not need travel support; however the Contractor should budget for Contractor staff travel. Travel and lodging arrangements shall be consistent with U.S. government travel, lodging, and per diem allowances. The objectives of the SC meeting will be to: (1) discuss and obtain feedback on the revised framework and methods; (2) discuss and finalize the annotated outline for the case study write-up; and (3) lay out a "map" of adaptation planning needs, based on lessons learned, to guide future project work.

Deliverable 11a: Presentation materials for SC working meeting **Due:** 2 weeks before meeting (date TBD)

Working in consultation with the WAM, the Contactor shall prepare meeting materials including: (1) an agenda for the 2 day meeting of the SC; (2) a PowerPoint presentation of the revised framework and methods (based on Deliverable 9b); and (3) an annotated outline for the case study write-up (based on Deliverable 10b).

Deliverable 11b: Attendance at SC working meeting **Due:** Meeting date TBD

Appropriate Contractor staff shall attend, present and assist the WAM in facilitating the 2 day working meeting of the SC.

Deliverable 11c: SC working meeting notes **Due:** 2 weeks after Deliverable 11b

The Contractor shall record notes of the deliberations, discussions and ideas of the SC during the course of the meeting and submit copies to the WAM for review.

MILESTONES AND DELIVERABLES:

Task	Milestone/Deliverable	Due Date
9	**Lessons Learned Report with Revised Adaptation Planning Framework and Methods**	
	9a: Workshop results/lessons learned memo (SC Call)	COMPLETED by 30 Sept 2014
	9b: Revised framework and methods (SC Call)	12 weeks after Deliverable 9a approved
	9c: Final framework and methods	12 weeks after Deliverable 11b
10	**Manuscript**	
	10a: Draft annotated outline (SC Call)	2 weeks after Deliverable 9b
	10b: Revised annotated outline	2 weeks after Deliverable 10a feedback
	10c: Draft manuscript (SC Call)	8 weeks after Deliverable 11c
	10d: Revised manuscript (SC Call)	8 weeks after Deliverable 10c feedback
	10e: Final manuscript	4 weeks after Deliverable 10d feedback
11	**In Person Working Meeting**	
	11a: Prepare meeting materials	2 weeks before meeting (date TBD)
	11b: Attend 2 day in person meeting	Meeting date TBD
	11c: Working meeting notes	2 weeks after Deliverable 11b

ACCEPTANCE CRITERIA:

The Contractor shall prepare high quality deliverables in accordance with academic standards. Deliverables shall be edited for grammar, spelling, and logic flow. The technical information shall be reasonably complete and presented in a logical, readable manner. Figures submitted shall be of high quality similar to presentations developed for national scientific forums and should be formatted as jpeg or png files. Text deliverables shall be provided in Microsoft Word 2007 or compatible format.

CONFLICT OF INTEREST:

The Contractor warrants that, to the best of the Contractor's knowledge and belief, that there are no relevant facts or circumstances which could give rise to a conflict of interest, as defined in FAR subpart 9.5, or that the Contractor has disclosed all such relevant information.

The Contractor agrees to notify the Contracting Officer immediately, that to the best of its knowledge and belief, no actual or potential conflict of interest exists or to identify to the Contracting Officer any actual or potential conflict of interest the Contractor may have.

The Contractor agrees that if an actual or potential conflict of interest is identified during the performance, the Contractor shall immediately make a full disclosure in writing to the Contracting Officer. This disclosure shall include a description of actions which the Contractor has taken or proposes to take, after consulting with the Contracting Officer, to avoid, mitigate, or neutralize the actual or potential conflict of interest. The Contractor shall continue performance until notified by the Contracting Officer of any contrary action to be taken.

MANAGEMENT CONTROLS:

1. The EPA will review and provide comments on the Work Plan and QAPP.

2. The EPA will also review and provide comments on all deliverables, with written confirmation of their acceptance required prior to completion of subsequent deliverables.

3. The Contractor shall clearly identify itself as an EPA contractor when acting in fulfillment of this contract. No decision-making activities relating to Agency policy, enforcement or future contracting shall take place if the Contractor is present. If the Contractor has a need to meet with Federal employees on-site, then the Contractor personnel shall visibly wear identification in performance of this contract while on-site that will be issued by the Government upon arrival to the Federal facility.

4. Technical Direction: The WAM is authorized to provide technical direction that clarifies the statement of work as set forth in this work assignment. Before initiating any action under technical direction, the contractor shall ensure that the technical direction falls within the scope of work for this work assignment. The technical direction shall be issued in writing by the WAM within four working days of verbal issuance. This will be forwarded to the PO and CO for their information and necessary actions.

   The WAM/COR is the only person authorized to make changes to this work assignment or contract. The changes must have prior approval from the WAM/COR in writing as an amendment or modification to the work assignment or contract.

   Technical direction includes direction to the contractor that assists the contractor in accomplishing individual tasks deemed appropriate under the Statement of Work, as well as comments and approval of reports and other deliverables

NOTICE REGARDING GUIDANCE PROVIDED UNDER THIS WORK ASSIGNMENT:

Guidance by the Contractor is strictly limited to management and analytical support. The Contractor shall not engage in activities of an inherently governmental nature such as the following:

1. Formulation of Agency policy
2. Selection of Agency priorities
3. Development of Agency regulations

Should the Contractor receive any instruction from an EPA staff person that the Contractor ascertains to fall into any of these categories or goes beyond the scope of the contractor or work assignment, the Contractor shall immediately contact the Project Officer or the Contract Specialist.

The Contractor shall also ensure that work under this individual work assignment does not contain any apparent or real personal or organizational conflict of interest. The Contractor shall certify that none exists at the time the work plan is submitted to EPA.

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 2-06

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-12-060	09/30/2012 To 09/29/2015 Base Option Period Number 2	Coral Reefs/Changing Climate

Contractor: TETRA TECH, INC.

Specify Section and paragraph of Contract SOW:

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [X] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 09/30/2014 To 09/29/2015

Comments:

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
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4										
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Authorized Work Assignment Ceiling

	Cost/Fee:	LOE:
Contract Period: 09/30/2012 To 09/29/2015	$0.00	0
This Action:	$66,923.00	453
Total:	$66,923.00	453

Work Plan / Cost Estimate Approvals

Contractor WP Dated: 10/15/2014	Cost/Fee: $66,923.00	LOE: 453
Cumulative Approved:	Cost/Fee: $66,923.00	LOE: 453

Work Assignment Manager Name: Jordan West (Signature) (Date)	Branch/Mail Code: Phone Number: 703-347-8584 FAX Number:
Project Officer Name: Sharon Boyde (Signature) (Date)	Branch/Mail Code: Phone Number: 703-347-8576 FAX Number: 703-374-8696
Other Agency Official Name (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Mark Cranley (Signature) 10/28/14 (Date)	Branch/Mail Code: CPOD Phone Number: 513-487-2351 FAX Number: 513-487-2109

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 2-06

☐ Other ☒ Amendment Number: 000001

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-12-060	09/30/2012 To 09/29/2015 Base Option Period Number 2	Adaptation Planning

Contractor: TETRA TECH, INC.

Specify Section and paragraph of Contract SOW: 2b

Purpose:
- ☐ Work Assignment
- ☒ Work Assignment Amendment
- ☐ Work Plan Approval
- ☐ Work Assignment Close-Out
- ☐ Incremental Funding

Period of Performance: From 09/30/2014 To 09/29/2015

Comments:

☐ Superfund — Accounting and Appropriations Data — ☒ Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
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Authorized Work Assignment Ceiling

Contract Period: 09/30/2012 To 09/29/2015 — Cost/Fee: — LOE:

This Action:

Total:

Work Plan / Cost Estimate Approvals

Contractor WP Dated: — Cost/Fee: — LOE:

Cumulative Approved: — Cost/Fee: — LOE:

Work Assignment Manager Name: Jordan West (Signature) (Date)	Branch/Mail Code: Phone Number: 703-347-8584 FAX Number:
Project Officer Name: Ruth Corn (Signature) (Date)	Branch/Mail Code: Phone Number: 513-569-7920 FAX Number:
Other Agency Official Name: (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Mark Cranley (Signature) 01/06/15 (Date)	Branch/Mail Code: CPOD Phone Number: 513-487-2351 FAX Number: 513-487-2109

Performance Work Statement

Tetra Tech, Inc.
Contract EP-C-12-060
Work Assignment No. 2-06
Amendment 1

TITLE: Adaptation Planning for Coral Reefs in a Changing Climate

PERIOD OF PERFORMANCE: Award date through September 29, 2015

WORK ASSIGNMENT MANAGER: Jordan West
Global Change Research Program
US Environmental Protection Agency
1200 Pennsylvania Ave., NW (8601P)
Washington, DC 20460
west.jordan@epa.gov
703-347-8584 (voice)
703-347-8694 (fax)

ALTERNATE WAM : Susan Julius
Global Change Research Program
US Environmental Protection Agency
1200 Pennsylvania Ave., NW (8601P)
Washington, DC 20460
julius.susan@epa.gov
703-347-8619 (voice)
703-347-8694 (fax)

This amendment is submitted to include the following tasks:

Task 12: Develop a Climate-Smart Design Tool

One of the outcomes of the July 2015 workshop was stakeholder interest in creating a tool for breaking down information on the myriad potential management activities into a series of Climate-Smart questions to support adaptation of these activities to render them as effective as possible in the context of climate change. Working in consultation with the WAM and the SC, the Contractor shall revise, enhance and expand upon a draft approach created at the workshop with the participants, to develop a "Climate-Smart Design Tool" as a component of the larger coral adaptation planning framework and methodology.

Deliverable 12a: Draft Climate-Smart Design Tool **Due:** 2 weeks before in-person meeting

Using the draft tabular approach developed at the workshop as a starting point, the contractor shall create a tool that breaks down Climate-Smart design considerations into a series of logical questions, along with information on measurable attributes being addressed, temporal sequencing of stressor and action elements, and the potential for trade-offs and other interactions among management actions.

Deliverable 12b: Present tool at working meeting **Due:** see 11b

The Contractor shall present the draft tool at the in-person working meeting of the technical team (see Task 11) for feedback and revision during the meeting.

Deliverable 12c: Revised Climate-Smart Design Tool **Due:** 10 weeks after Deliverable 11c

Based on the feedback at the in-person meeting, the Contractor shall revise, enhance and/or expand the Climate-Smart Tool.

Deliverable 12d: Webinar for stakeholders **Due:** 2 weeks after Deliverable 12c

The Contractor shall prepare a presentation and organize a webinar for the stakeholders that were present at the July 2014 workshop, along with other interested stakeholders, in order to share the Climate-Smart Design Tool and obtain their feedback.

Deliverable 12e: Final Climate-Smart Design Tool **Due:** 8 weeks after Deliverable 12d

Based on the results of the stakeholder webinar, the Contractor shall finalize the Climate-Smart Design Tool.

MILESTONES AND DELIVERABLES:

Task	Milestone/Deliverable	Due Date
9	**Lessons Learned Report with Revised Adaptation Planning Framework and Methods**	
	9a: Workshop results/lessons learned memo (SC Call)	COMPLETED
	9b: Revised framework and methods (SC Call)	10 weeks after Deliverable 9a approved (see 11a)
	9c: Final framework and methods	10 weeks after Deliverable 11c (with 10c)
10	**Manuscript**	
	10a: Draft annotated outline (SC Call)	10 weeks after Deliverable 9a approved (see 11a)
	10b: Revised annotated outline	2 weeks after Deliverable 11b (with 11c)
	10c: Draft manuscript (SC Call)	10 weeks after Deliverable 11c
	10d: Revised manuscript (SC Call)	8 weeks after Deliverable 10c feedback
	10e: Final manuscript	8 weeks after Deliverable 10d feedback
11	**In Person Working Meeting**	
	11a: Prepare meeting materials	2 weeks before meeting (date TBD)
	11b: Attend 2 day in person meeting	Meeting date TBD
	11c: Working meeting notes	2 weeks after Deliverable 11b
12	**Climate Smart Design Tool**	
	12a: Draft CS Design Tool	2 weeks before in-person meeting (with 9b)
	12b: Present/gather feedback at in-person working meeting of technical team	At in-person working meeting (see 11b)
	12c: Revised CS Design Tool	10 weeks after Deliverable 11c (with 9c and 10c)
	12d: Organize webinar for stakeholders to present/gather feedback on CS Design Tool	2 weeks after Deliverable 12c
	12e: Final CS Design Tool	8 weeks after Deliverable 12d (with 10d)

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 2-06

☐ Other ☒ Amendment Number: 000001

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-12-060	09/30/2012 To 09/29/2015	
	Base Option Period Number 2	

Contractor: TETRA TECH, INC.

Specify Section and paragraph of Contract SOW:

Purpose:
- ☐ Work Assignment
- ☒ Work Assignment Amendment
- ☒ Work Plan Approval
- ☐ Work Assignment Close-Out
- ☐ Incremental Funding

Period of Performance: From 09/30/2014 To 09/29/2015

Comments:

☐ Superfund — Accounting and Appropriations Data — ☒ Non-Superfund

SFO (Max 2): ☐

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
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Authorized Work Assignment Ceiling

		Cost/Fee:	LOE:
Contract Period:	09/30/2012 To 09/29/2015	$116,871.00	0
This Action:		$0.00	0
Total:		$116,871.00	828

Work Plan / Cost Estimate Approvals

		Cost/Fee:	LOE:
Contractor WP Dated:	01/21/2015	$0.00	0
Cumulative Approved:		$116,871.00	828

Work Assignment Manager Name: Jordan West (Signature) (Date)		Branch/Mail Code: Phone Number: 703-347-8584 FAX Number:
Project Officer Name: Ruth Corn (Signature) (Date)		Branch/Mail Code: Phone Number: 513-569-7920 FAX Number:
Other Agency Official Name (Signature) (Date)		Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Mark Cranley (Signature) 02/04/15 (Date)		Branch/Mail Code: CPOD Phone Number: 513-487-2351 FAX Number: 513-487-2109

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 2-07

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-12-060	09/30/2012 To 09/29/2015 Base Option Period Number 2	EnviroAtlas

Contractor: TETRA TECH, INC.

Specify Section and paragraph of Contract SOW: 2a

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 09/30/2014 To 09/29/2015

Comments:

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
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Authorized Work Assignment Ceiling

	Cost/Fee:	LOE:
Contract Period: 09/30/2012 To 09/29/2015		
This Action:		
Total:		

Work Plan / Cost Estimate Approvals

	Cost/Fee:	LOE:
Contractor WP Dated:		
Cumulative Approved:		

Work Assignment Manager Name: Megan Mehaffey (Signature) (Date)		Branch/Mail Code: Phone Number: 919-541-4205 FAX Number:
Project Officer Name: Sharon Boyde (Signature) (Date)		Branch/Mail Code: Phone Number: 703-347-8576 FAX Number: 703-374-8696
Other Agency Official Name (Signature) (Date)		Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Mark Cranley (Signature) 09/12/14 (Date)		Branch/Mail Code: C POD Phone Number: 513-487-2351 FAX Number: 513-487-2109

TETRA TECH
EP-C-12-060
Work Assignment 2-07

TITLE: EnviroAtlas: Watershed tools, Flow-weighted tool evaluation, and Climate Adaptation Metrics

PERIOD OF PERFORMANCE: CO Approval thru September 29, 2015

WORK ASSIGNMENT MANAGER: Megan Mehaffey
ORD/NERL/LEB/ESD
109 TW Alexander Drive
Mail Code: E243-05
919-541-0620
E-Mail: Mehaffey.megan@epa.gov

Performance Work Statement:

(A) *Goal/Purpose*: EPA's Office of Research Development and its partners are developing the EnviroAtlas for the Sustainability and Communities Program. The EnviroAtlas is an online decision support tool that allows users to view and analyze the geographical distribution of supply, demand, and drivers of change related to natural and built infrastructure at multiple scales for the nation. Explicit relationships between human health and well-being and the services provided by the ecosystem will communicate a full accounting of how decisions affect communities' progress towards sustainability under different scenarios. Through the EnviroAtlas users will have access to a suite of the metrics.

(B) *Discussion*: The world around us is changing rapidly - economies, populations, and climate are undergoing major transformations, which require new and updated policies that ensure health, safety, and sustainability in the ways humans interact with the planet. To react to these changes in positive, helpful ways, we need a common understanding, across our country and the world, of the natural sciences and engineered developments that affect our lives. The long-term health and well-being of people is tied to the quality of the natural environment and the manmade places around them: the towns, cities, and rural and natural land areas where they live, work, and play. At present, the many goods and services that we get from nature (ecosystem services) are well-known, but not always kept in mind when decisions are made. Often, decisions on development and environmental policy have been made based on incomplete understanding of the interactions between human activities and ecosystem services. For the well-being of present and future generations, we must understand our needs for sustainable practices and ecosystem services.

(C) *Work Assignment (SOW)*:
Task 1. The contractor shall prepare and submit a quality assurance project plan (QAPP) addressing the activities for the tasks that follow. Other project-specific document(s) that discuss quality assurance and/or quality control requirements and procedures, may also be submitted to the WACOR for review and approval before work begins on the project so that all parties have a clear understanding of the project goals, the deliverables and schedule for their submission, and the established quality standards that must be met for the intended use of the products.

Task 2. The contractor shall evaluate and improve the HUC Navigation Tool that is currently in the EnviroAtlas. The contractor shall check that the tool functions properly and is allowing the user to view up or downstream HUCS by either choosing travel time or distance (stream miles). The contractor shall identify watersheds naturally do not have an inflow or outflow as well as those HUCS where the navigation is not working correctly. The contractor shall provide a list of HUCs that are naturally isolated and those that are not working correctly in the mapping application tool. The contractor shall work with EnviroAtlas web-tool developers to upload changes to the tool or notify them of the list of HUCs that are not going to work in the tool.

Task 3. The contractor shall apply the Revised Universal Soil Loss Equation (RUSLE) model to the CONUS and also modify the equation to derive a quantitative approximation of the ecological services provided by vegetative cover type, management practices, and other surface features with respect to protecting soils from erosion. The contractor shall calculate quantities of soil retained on the landscape as well as potential erosion for multiple scenarios with the first representative of current (NLDC 2011) conditions, other scenarios relating to application of best management practices will be provided by EPA. The contractor shall use the SSURGO soils data provided by EPA, PRISM rainfall data, and National Elevation Data provided by NHDPlus V2. The contractor shall calculate slope length to be used in RUSLE. The contractor shall provide a gridded 30 m coverage of the results and summarized results aggregated to 12 digit HUCs which will be provided by EPA. The contractor shall apply a method such as SEDMOD to estimate nutrient and sediment loads associated with reduced erosion for each scenario. Output shall be provided as raw raster or shape files and summarized tables as excel, dbf, or csv for HUC12s.

Task 4. The contractor shall conduct a methods and data availability review of 25, 50 and 100-year, 24-hour storm event means with probable recurrence intervals. The contractor shall apply the methods to calculate the maximum 24-hour precipitation events using past and current data as needed. The contractor shall use climate scenario information on precipitation to calculate future storm events and apply them to the CN methods developed under WA 1-07 to future climate information. Gridded data on future climate precipitation information will be provided by the EPA. The contractor shall summarize runoff by 12 digit HUCs provided by EPA. Output will be provided as raw raster or shape files and summarized tables as excel, dbf, or csv for HUC12s.

Task 5. The contractors shall conduct local comparisons with data from the Calapooia River Watershed (CRW) to evaluate uncertainty, limitations, and validity of regional models for flow-based metrics and predictions. The contractor shall evaluate how varying temporal and spatial resolution of stream datasets, spatial resolution and flow routing techniques of elevation data, and spatial resolution of riparian landcover influence flow-weighted metric outputs and their relationship to response variables using the modified riparian metric tool developed in WA1-07. In the initial evaluation the contractor shall include broadest stream, broadest DEM, flow algorithm, summer streams, and landcover comparisons. The contractors shall keep track of processing times for the various runs to determine computational costs of finer scale data. Streams, elevation, and landcover datasets will be provided to the contractors by EPA. The work flow of comparison should be done such that comparisons and summary results for sub-watersheds within the CRW are automated as much as possible. The contractors shall develop a consolidated program or tool that completes and summarizes the comparisons for easy application to other areas of the United States. Outputs shall include the raw buffer width raster and the summarized table of riparian outputs using NHDPLus v2 catchments. Additional comparisons may be included after discussion of the results from the first set of metric runs.

Task 6. The contractor shall perform a literature search to evaluate the current state of research for conducting fish habitat assessments and potential impacts related to climate change. The focus of the literature search shall be on threatened and endangered species identified by the Endangered Species Act for the conterminous US. The contractor shall evaluate currently available quantifiable methods for modeling climate change effects on specific fish species in terms of thermal changes, gradient barriers (both anthropogenic and natural), precipitation, and stream flow for future development of a national metric. Provide available habitat data as raw raster or shape files and summarized tables as excel, dbf, or csv for HUC12s.

Task 7. The contractor will do a methods and data availability review for the 7Q10 low flow estimation. The focus will be on using Stream Stats and other data sources to determine where across the U.S. low flow has been calculated and to determine if other data or methods are available for predicting the 7Q10 for the remaining states in the conterminous US.

(D) *Deliverables and Project Schedule*:

Task #	Deliverable	Due Date
Work Plan	TWP	20 days after receipt of WA
Task 1. QAPP	Quality Assurance Project Plan	30 days after accepted TWP
Task 2 HUC12 Nav Tool	Report on issues and list of problem HUC12s	12/01/2014
Task 3 RUSLE	Sediment estimates for HUC12	01/30/2015

Task 4 Storm Events	25, 50 and 100 year storm event GIS data	02/30/2015
Task 4 CN runoff	CN runoff for future climate scenarios HUC12 tables	03/30/2015
Task 5. Flow Model	Sensitivity analysis GIS raster data	04/30/2015
Task 5. Flow Model	Sensitivity analysis GIS NHD plus tables	05/30/2015
Task 6. Fish Habitat	Available habitat data (i.e. fish obstruction counts)	01/30/2015
Task 6. Fish Habitat	Report on methods and data availability	07/30/2015
Task 7. 7Q10	Report on methods and data availability	08/30/2014

(F) *QA/QC Requirements for WA*: All deliverables will be evaluated as to their quality by the WACOR. Deliverables of unacceptable quality will be returned to the contractor for revision. Spatial data shall meet federal FGDC standards and metadata shall be provided with each deliverable.

EPA National Geospatial Data Policy (NGDP)

Whenever practical and applicable, this research shall adhere to the *EPA National Geospatial Data Policy* (NGDP) which establishes principles, responsibilities, and requirements for collecting and managing geospatial data used by Federal environmental programs an within the jurisdiction of the U.S. Environmental Protection Agency (EPA). This Policy also establishes the requirement of collectin managing geospatial metadata describing the Agency's geospatial assets to underscore EPA's commitment to data sharing, promoting secondary data use, and supporting the National Spatial Data Infrastructure (NSDI). Reference: USEPA. US Environmental Protecti Agency, CIO Policy Transmittal 05-022, Classification No. 2121, Policy Title: *EPA National Geospatial Data Policy*, http://www.epa.gov/nerlesd1/gqc/pdf/epa_natl_geo_data_policy.pdf August 24, 2005 [URL cited September 29, 2011].

EPA National Geospatial Data Policy Procedure for Geospatial Metadata Management

Whenever practical and applicable, this research shall adhere to the *EPA National Geospatial Data Policy Procedure for Geospatial M Management* which establish procedures, requirements and responsibilities to implement a data life cycle, as defined in the National G Data Policy (NGDP), for all geospatial metadata used by federal environmental programs and projects within the jurisdiction of the U Environmental Protection Agency (EPA). Reference: USEPA. US Environmental Protection Agency, CIO Policy Transmittal 08-00 Classification No. CIO 2131-P-01-0, Policy Title: *EPA National Geospatial Data Policy Procedure for Geospatial Metadata Manage* http://www.epa.gov/geospatial/docs/2131.pdf October 25, 2007 [URL cited September 29, 2011].

(G) *Special Requirements:* N/A

(H) *Reports and Meetings:* Periodic conference calls (e.g. every 2 weeks) to review status of the deliverable will be scheduled by EPA.

(i) Any additional reports needed beyond those automatically provided: ____ Yes __x__ No *(If yes, please specify)*

(ii) Indicate your requirements for meetings with task manager: meetings can occur by phone

as needed to address technical questions.

	Need (Yes/No)	Purpose	Frequency
	yes	to discuss work plan	once
	yes	to review data, analyses, or NGI metric development	as-needed
	no	to review monthly cost report	Monthly
	yes	to review quarterly progress report	quarterly
		other:	

(I) *Travel/Training Requirements (include destination/dates/purpose):* No travel is anticipated with this WA.

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 2-07

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-12-060	09/30/2012 To 09/29/2015 Base Option Period Number 2	Enviroatlas

Contractor: TETRA TECH, INC.

Specify Section and paragraph of Contract SOW:

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [X] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 09/30/2014 To 09/29/2015

Comments:

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

	Cost/Fee:	LOE:
Contract Period: 09/30/2012 To 09/29/2015	$0.00	0
This Action:	$154,635.00	1,450
Total:	$154,635.00	1,450

Work Plan / Cost Estimate Approvals

	Cost/Fee:	LOE:
Contractor WP Dated: 10/15/2014	$154,635.00	1,450
Cumulative Approved:	$154,635.00	1,450

Work Assignment Manager Name: Megan Mehaffey (Signature) (Date)	Branch/Mail Code:	
	Phone Number: 919-541-4205	
	FAX Number:	
Project Officer Name: Sharon Boyde (Signature) (Date)	Branch/Mail Code:	
	Phone Number: 703-347-8576	
	FAX Number: 703-374-8696	
Other Agency Official Name (Signature) (Date)	Branch/Mail Code:	
	Phone Number:	
	FAX Number:	
Contracting Official Name: Mark Cranley (Signature) 10/28/14 (Date)	Branch/Mail Code: CPOD	
	Phone Number: 513-487-2351	
	FAX Number: 513-487-2109	

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 2-12

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-12-060	09/30/2012 To 09/29/2015 Base Option Period Number 2	Downstream Use Protection

Contractor	Specify Section and paragraph of Contract SOW
TETRA TECH, INC.	2e

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 09/30/2014 To 09/29/2015

Comments:

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period:	Cost/Fee:	LOE:
09/30/2012 To 09/29/2015		
This Action:		
Total:		

Work Plan / Cost Estimate Approvals

	Cost/Fee:	LOE:
Contractor WP Dated:		
Cumulative Approved:		

Work Assignment Manager Name Jim Hagy (Signature) (Date)		Branch/Mail Code: Phone Number 850-934-2455 FAX Number:
Project Officer Name Sharon Boyde (Signature) (Date)		Branch/Mail Code: Phone Number: 703-347-8576 FAX Number: 703-374-8696
Other Agency Official Name (Signature) (Date)		Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name Mark Cranley (Signature) (Date) 11/06/14		Branch/Mail Code: CPOD Phone Number: 513-487-2351 FAX Number: 513-487-2109

PERFORMANCE WORK STATEMENT

Tetra Tech, Inc.
Contract EP-C-12-060
Work Assignment No. 2-12

TITLE: Methods for Computing Downstream Use Protection Criteria for Lakes and Reservoirs

PERIOD OF PERFORMANCE: Award date through July 31, 2015

WORK ASSIGNMENT MANAGER: James D. Hagy III
U.S. Environmental Protection Agency
Office of Research and Development
National Health and Environmental
Effects Research Laboratory
Gulf Ecology Division
1 Sabine Island Drive
Gulf Breeze, FL 32561
850-934-2455 (voice)
850-934-2401 (fax)
hagy.jim@epa.gov (E-mail)

ALTERNATE WAM : John C. Lehrter
850-934-9255 (voice)
850-934-2401 (fax)
lehrter.john@epa.gov (E-mail)

INTRODUCTION

Excess loading of N and P is among the most prevalent cause of water quality impairment in the United States, affecting 6,950 surface water bodies for nutrients and 6,511 surface water bodies for organic enrichment/ oxygen depletion (2010 CWA Sec. 303(d) List). Excess N and P in aquatic systems comes from many point and nonpoint sources, including urban and suburban stormwater runoff, municipal and industrial waste water discharges, fertilizer use, livestock production, atmospheric deposition resulting from fossil fuel combustion and ammonia emissions from industrial scale agriculture, and legacy groundwater nutrient pollution. Land use alterations in watersheds across the nation increase the fraction of the N and P applied to the landscape that reaches surface and groundwater resources, impacting aquatic life uses, human health and economic prosperity.

One immediate need that will support the long-term goal of optimal and sustainable nutrient management stems from an emerging view that existing narrative nutrient criteria are inadequate to protect the Nation's waters from possible impacts resulting from nutrient enrichment. Scientifically sound methodologies are needed for translating narrative nutrient criteria to develop quantitative and enforceable numeric nutrient criteria. Nowhere is this need more

apparent than for the Nation's freshwaters, which are bound closely within watersheds directly to the anthropogenic factors that lead to nutrient impairments. Unfortunately, there are thousands of lakes and reservoirs and even more stream reaches draining into these receiving waters, making the task of developing numeric criteria waterbody-by-waterbody truly enormous. In the past, EPA has addressed the large number of waterbodies using a classification and reference condition approach, developing criteria by ecoregion and waterbody type. Another possible approach to managing nutrient enrichment in freshwater systems rests on re-casting the problem as one involving not thousands of separate water bodies (lakes and reservoirs, stream reaches, etc.), but a relatively smaller (but still large) number of watersheds. Within watersheds, receiving waters are focal points for nutrient effects resulting from nutrients transported in stream and river networks. Nutrient concentrations in lakes - and resulting water quality - reflect nutrient concentrations in the contributing rivers and streams, as modified by lake processes. Consequently, nutrient management in lakes could be improved by improving our ability to describe nutrient sensitive aquatic life uses in lakes and possible relationships to nutrient inputs and resulting water quality. Subsequently, management of nutrients in streams and rivers that discharge into lakes may linked to the requirements for protecting downstream lakes. A similar approach could be used to inform management of nutrients in streams and rivers that flow into downstream estuaries and coastal waters, but is not the focus of this project.

EPA has recently received a completed analysis of nutrient-sensitive aquatic life use endpoints that could be used to develop numeric nutrient criteria for natural lakes in the upper midwestern US and reservoirs in the southeastern US (Paul et al. 2014). This work assignment is to build on that to research to (1) develop relationships between nutrient loading and/or concentration and identified aquatic life use endpoints for lakes and reservoirs and (2) develop a model or models and associated justification for computing numeric criteria for streams within the watershed of targeted lakes or reservoirs that, if met, would provide an expectation that the identified nutrient-sensitive aquatic life uses of the receiving lake or reservoir would not be impaired by nutrients from the watershed draining into the lake. EPA has funded research addressing these objectives under a previous work assignment. This work assignment encompasses a continuation and completion of that work.

OBJECTIVES

The objectives of this project will be to describe new approaches that could be used to develop numeric nutrient criteria for lakes and their contributing networks of streams and rivers. The research effort will utilize existing publications and data rather than new field studies. Project focus areas will include (1) characterizing aquatic life uses of US lakes and identifying which among these uses are most sensitive to impacts resulting from nutrient enrichment, (2) evaluating existing science and developing new analyses to predict nutrient concentrations in lakes and their watersheds and the relationship between nutrients and support for aquatic life uses, and (3) developing methods for computing numeric nutrient criteria for streams in order to protect downstream lakes and reservoirs.

The work assignment is structured into 5 research tasks and three process related tasks. In **Task 1**, the Contractor will develop a workplan and QAPP. As this work is a continuation of an

existing assignment, the workplan and QAPP should be adapted from existing document and are afforded 2 weeks. **Tasks 2** through **5** describe two aspects of the project (nutrient criteria development and DPV development) to be implemented for each of two focal areas. All four of these tasks are related but not dependent. Therefore, they can be pursued concurrently. A mid-project update and draft final report are required for each task. The progress reports may be structured as a letter report with accompanying presentation materials from the mid-project review meeting. As the mid-project review occurred in September 2014 and the presentation materials already exist, this is due 5 business days after completion of the revised work plan and QAPP. **Task 6** is development of a final project report and presentation to EPA ORD and OW via a webinar. **Task 7** encompasses communication and record keeping throughout the duration of the project.

SPECIFIC TASKS:

Task 1. Revise/Update the Detailed Work Plan and QAPP from the FY2014 Work Assignment.

The contractor shall develop a detailed work plan addressing the objectives of this work assignment and the basic outline provided by the Tasks (below) and associated deliverables (below) and submit it to EPA for review. The work plan shall be based on the existing work plan developed for WA1-12 during Option Period 1. EPA review the work plan within 5 business days of receiving it and return it to the contractor for any necessary revision.

The contractor shall also develop an addendum to the approved Quality Assurance Project Plan (QAPP) for WA 1-12 addressing any changes or additions necessary to address all work outlined in the work plan and submit it to EPA for review and approval by the WAM and the EPA QA Officer. Work on the QAPP addendum may proceed concurrently with development of the work plan. The QAPP addendum shall outline any changes in the approach and measures, relative to the approved QAPP for the 1-12 work assignment, that the Contractor will implement to ensure a high standard of quality in data analysis and written deliverables. The QAPP shall be in conformance with EPA's Requirements for Quality Assurance Project Plans (EPA QA/R-5). As this work assignment reflects a continuation of work under Work Assigment 1-12, the QAPP should be created as an addendum to the approved QAPP for work assignment 1-12, reflecting only changes as necessary. EPA will review and approve the QAPP addendum within two (2) weeks after receiving it.

Task 1 Deliverable (1a): Submit a detailed work plan to EPA for approval. Due 14 days after Work Assignment award date.

Task 1 Deliverable (1b): Submit a QAPP to EPA for approval. Due 5 days after final approval of work plan.

Task 2. Complete development of quantitative methods for determining nutrient loading or concentration limits that will protect identified nutrient-sensitive aquatic life uses in a small subset of lakes in Wisconsin

In this task, the contractor shall devise and implement an analytical procedure using existing data to determine numeric nutrient concentrations or loading limits that, if achieved, would be expected to support attainment of one or more identified nutrient-sensitive aquatic life uses in Wisconsin lakes. Work under this task will build on previous research completed by TetraTech under the Streams II contract (as described by Paul et al. 2014) and under Work Assignment 1-12. This task is intended to demonstrate possible approaches, rather than to actually develop criteria for any particular lake. Therefore, the study site(s) shall be selected optimally based on data availability and other factors to further this research purpose. Work under this task shall include describing the rationale for the analytical approach and any significant technical challenges, in addition to a description of the final approach that is developed.

Task 2 Deliverable (2a). Progress report in the form of a descriptive cover letter/summary and presentations resulting from September 30 progress meeting addressing approaches for developing numeric nutrient criteria that support identified nutrient-sensitive aquatic life uses for one or more upper midwest lakes. *Due 5 days after QAPP approval.*

Task 2 Deliverable (2b). Draft final report on approaches for developing numeric nutrient criteria that support identified nutrient-sensitive aquatic life uses for one or more upper midwest lakes. *Due February 20, 2015.*

Task 3. Develop quantitative methods for determining nutrient loading or concentration limits that will protect identified nutrient-sensitive aquatic life uses in a small subset of Tennessee reservoirs.

In this task, the contractor shall devise and implement an analytical procedure using existing data to determine numeric nutrient concentrations or loading limits that, if achieved, would be expected to support attainment of one or more identified nutrient-sensitive human and aquatic life uses in southeastern reservoirs. Work under this task will build on previous research completed by TetraTech under the Streams II contract (as described by Paul et al. 2014) and under Work Assignment 1-12. This task is intended to demonstrate possible approaches, rather than to actually develop criteria for any particular reservoir. Therefore, the study site(s) shall be selected optimally based on data availability and other factors to further this research purpose. Work on this task shall include discussion of any issues related to developing criteria when management for different human and aquatic life uses result in conflicting ecological requirements.

Task 3 Deliverable (3a). Progress report in the form of a descriptive cover letter/summary and presentations resulting from September 30 progress meeting addressing approaches for developing numeric nutrient criteria that support identified nutrient-sensitive human and aquatic life uses for one or more Tennessee reservoirs. *Due 5 days after QAPP approval.*

Task 3 Deliverable (3b). Draft final report report on approaches for developing numeric nutrient criteria that support identified nutrient-sensitive human and aquatic life uses for one or more reservoirs in Tennessee. *Due February 20, 2015*

Task 4. Develop watershed models or other analytical approaches for deriving numeric nutrient criteria for flowing waters in the watershed of Holcombe Flowage, WI that will support attainment of identified numeric criteria and aquatic life uses in the lake.

In this task the Contractor shall devise and implement an analytical approach, possibly including watershed simulation models, the SPARROW model, and SSN/STARS network flow kriging to develop numeric nutrient criteria for streams in the watershed of Holcombe Flowage, WI, such that if the criteria were achieved it would provide an expectation of attainment of nutrient criteria and associated nutrient-sensitive uses in Holcombe Flowage (i.e., DPVs). In this task, the primary focus is identification, discussion, analysis and possible solution of important technical issues related to development of DPVs, since the goal is to develop an approach, not criteria that will be proposed for the specific lake. Thus, the contractor shall (1) develop the approach, (2) identify possible problems, key areas of uncertainty, and possible solutions, and (3) suggest additional research that could reduce uncertainty and promote eventual adoption of the methods by regulatory agencies.

Task 4 Deliverable (4a). Progress report in the form of a descriptive cover letter/summary and presentations resulting from September 30 progress meeting addressing approaches for development of watershed models or other analytical approaches for deriving DPVs for Holcombe Flowage, SI. *Due 5 days after QAPP approval.*

Task 4 Deliverable (4b). Draft final report on development of watershed models or other analytical approaches for deriving DPVs for Holcombe Flowage, SI. *Due February 20, 2015*

Task 5. Develop watershed models or other analytical approaches for deriving numeric nutrient criteria for flowing waters that will support attainment of identified numeric criteria and aquatic life uses in downstream lakes in Tennessee.

In this task the Contractor shall devise and implement an analytical approach, possibly including watershed simulation models, to develop numeric nutrient criteria for streams in the watershed of one or more reservoirs in Tennessee that, if achieved, would provide an expectation of attainment of nutrient criteria and associated nutrient-sensitive human and aquatic life uses in the downstream receiving lake(s) (i.e., DPVs). In this task, the primary focus is as in Task 4. Thus, the contractor shall (1) develop the approach, (2) identify possible problems, key areas of uncertainty, and possible solutions, and (3) suggest additional research that could reduce uncertainty and promote eventual adoption of the methods by regulatory agencies.

Task 5 Deliverable (5a). Progress report in the form of a descriptive cover letter/summary and presentations resulting from September 30 progress meeting addressing approaches for development of watershed models or other analytical approaches for deriving DPVs for one or more reservoirs in Tennessee. *Due 5 days after QAPP approval.*

Task 5 Deliverable (5b). Draft final report on development of watershed models or other analytical approaches for deriving DPVs for the watershed of one or more reservoirs in Tennessee. *Due February 20, 2015*

Task 6. Complete Final Project Report and Present Findings to ORD and OW audience via Webinar.

The Contractor shall address EPA comments regarding the Draft Final Report, consisting of deliverables 2b, 3b, 4b, and 5b and produce an integrated final report addressing the goals of all tasks under this Work Assignment. In addition, the contractor shall prepare a presentation addressing project findings and present it via Webinar. The Webinar date shall be determined in consultation with the WAM at least 3 weeks prior to the Webinar date. The WAM will announce the webinar to potential audiences.

Task 5 Deliverable (6a). Complete final integrated project report, addressing comments on the report provided by EPA. *Due March 13, 2015.*

Task 5 Deliverable (6b). Present findings to ORD and OW audience via Webinar. *Due June 26, 2015.*

Task 7. Prepare a manuscript in a style and format suitable for publication in a peer-reviewed scientific journal, addressing the most significant findings under the work assignment.

In consultation with the EPA WAM, the contractor shall identify the most significant findings resulting from research conducted under the work assignment and prepare a manuscript addressing the findings and their significance. The manuscript shall be prepared in a style and format suitable for publication in a peer-reviewed scientific journal. The manuscript may draw directly as is useful and appropriate from the Final Report (Task 6).

Task 7 Deliverable (7a). Complete draft manuscript. *Due June 26, 2015.*

Task 8. Progress Reviews and Monthly Reports

The purpose of this task is to monitor and ensure regular progress on the tasks outlines in the work assignment. Work under this task shall include: (1) A bi-weekly call including minimally the TetraTech technical point of contact and the EPA work assignment manager to discuss any issues or concerns. This call may be cancelled or rescheduled upon mutual agreement between TetraTech and the WAM; (2) Progress reviews via webinar every 6 weeks from initiation of the work assignment until completion of the draft final report. During these reviews, key TetraTech personnel will describe progress to date and review next steps with the WAM. The draft workplan shall include mutually agreed-upon tentative dates for all progress reviews.

Task 8 Deliverable. The contractor shall provide to EPA any presentation materials used for progress reviews within 5 days after each progress update.

REFERENCES:

Paul, MJ, A Herlihy, D Bressler, L. Zheng and A Roseberry-Lincoln. 2014. Methodologies for

development of numeric nutrient criteria for freshwaters. Final Report to US EPA National Health and Environmental Effects Research Laboratory, Gulf Ecology Division. 144 pp.

CONFLICT OF INTEREST:

The Contractor warrants that, to the best of the Contractor's knowledge and belief, that there are no relevant facts or circumstances which could give rise to a conflict of interest, as defined in FAR subpart 9.5, or that the Contractor has disclosed all such relevant information.

The Contractor agrees to notify the Contracting Officer immediately, that to the best of its knowledge and belief, no actual or potential conflict of interest exists or to identify to the Contracting Officer any actual or potential conflict of interest the Contractor may have.

The Contractor agrees that if an actual or potential conflict of interest is identified during the performance, the Contractor shall immediately make a full disclosure in writing to the Contracting Officer. This disclosure shall include a description of actions which the Contractor has taken or proposes to take, after consulting with the Contracting Officer, to avoid, mitigate, or neutralize the actual or potential conflict of interest. The Contractor shall continue performance until notified by the Contracting Officer of any contrary action to be taken.

MANAGEMENT CONTROLS:

1. The EPA will review and provide comments on the Work Plan and QAPP.

2. The EPA will also review and provide comments on the subsequent module outlines, module drafts, and conceptual models for each of the candidate causes.

3. The Contractor shall clearly identify itself as an EPA contractor when acting in fulfillment of this contract. No decision-making activities relating to Agency policy, enforcement or future contracting shall take place if the Contractor is present. If the Contractor has a need to meet with Federal employees on-site, then the Contractor personnel shall visibly wear identification in performance of this contract while on-site that will be issued by the Government upon arrival to the Federal facility.

4. Technical Direction: The WAM is authorized to provide technical direction that clarifies the statement of work as set forth in this work assignment. Before initiating any action under technical direction, the contractor shall ensure that the technical direction falls within the scope of work for this work assignment. The technical direction shall be issued in writing by the WAM within four working days of verbal issuance. This will be forwarded to the PO and CO for their information and necessary actions.

   The WAM/COR is the only person authorized to make changes to this work assignment

or contract. The changes must have prior approval from the WAM/COR in writing as an amendment or modification to the work assignment or contract.

Technical direction includes direction to the contractor that assists the contractor in accomplishing individual tasks deemed appropriate under the Statement of Work, as well as comments and approval of reports and other deliverables

NOTICE REGARDING GUIDANCE PROVIDED UNDER THIS WORK ASSIGNMENT:

Guidance by the Contractor is strictly limited to management and analytical support. The Contractor shall not engage in activities of an inherently governmental nature such as the following:

1. Formulation of Agency policy
2. Selection of Agency priorities
3. Development of Agency regulations

Should the Contractor receive any instruction from an EPA staff person that the Contractor ascertains to fall into any of these categories or goes beyond the scope of the contractor or work assignment, the Contractor shall immediately contact the Project Officer or the Contract Specialist.

The Contractor shall also ensure that work under this individual work assignment does not contain any apparent or real personal or organizational conflict of interest. The Contractor shall certify that none exists at the time the work plan is submitted to EPA.

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 2-12

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-12-060	09/30/2012 To 09/29/2015 Base Option Period Number 2	Downstream Use Protection

Contractor	Specify Section and paragraph of Contract SOW
TETRA TECH, INC.	2e

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 09/30/2014 To 09/29/2015

Comments:

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period: 09/30/2012 To 09/29/2015 — Cost/Fee: — LOE:

This Action:

Total:

Work Plan / Cost Estimate Approvals

Contractor WP Dated: — Cost/Fee: — LOE:

Cumulative Approved: — Cost/Fee: — LOE:

Work Assignment Manager Name: Jim Hagy (Signature) (Date)	Branch/Mail Code: Phone Number: 850-934-2455 FAX Number:
Project Officer Name: Sharon Boyde (Signature) (Date)	Branch/Mail Code: Phone Number: 703-347-8576 FAX Number: 703-374-8696
Other Agency Official Name (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Mark Cranley (Signature) 01/20/14 (Date)	Branch/Mail Code: C POD Phone Number: 513-487-2351 FAX Number: 513-487-2109

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 2-13

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-12-060	09/30/2012 To 09/29/2015	Climate Change
	Base Option Period Number 2	

Contractor	Specify Section and paragraph of Contract SOW
TETRA TECH, INC.	2e

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 09/30/2014 To 09/29/2015

Comments:

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
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Authorized Work Assignment Ceiling

Contract Period:	Cost/Fee:	LOE:
09/30/2012 To 09/29/2015		
This Action:		
Total:		

Work Plan / Cost Estimate Approvals

Contractor WP Dated:	Cost/Fee:	LOE:
Cumulative Approved:	Cost/Fee:	LOE:

Work Assignment Manager Name: Susan Julius (Signature) (Date)	Branch/Mail Code: Phone Number: 703-347-8619 FAX Number:
Project Officer Name: Sharon Boyde (Signature) (Date)	Branch/Mail Code: Phone Number: 703-347-8576 FAX Number: 703-374-8696
Other Agency Official Name (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Mark Cranley (Signature) 09/30/14 (Date)	Branch/Mail Code: CPOD Phone Number: 513-487-2351 FAX Number: 513-487-2109

Performance Work Statement
Tetra Tech, Inc.
Contract EP-C-07-068
Work Assignment No. 2-13

I. Title: Climate Change and Urban Stormwater Design Guide

II. Period of Performance: September 30, 2014 through September 29, 2015

III. Work Assignment Manager:
Susan Julius
U.S. Environmental Protection Agency
Office of Research and Development
National Center for Environmental Assessment (8601-P)
1200 Pennsylvania Avenue, NW
Washington, DC 20460
703-347-8619 (phone)
703-347-8694 (fax)
Julius.susan@epa.gov

Alternate WAM:
Britta Bierwagen, PhD
U.S. Environmental Protection Agency
Office of Research and Development
National Center for Environmental Assessment (8601-P)
1200 Pennsylvania Avenue, NW
Washington, DC 20460
703-347-8613
bierwagen.britta@epa.gov

IV. Total Estimated LOE: 934 hours

V. Introduction:
The EPA Office of Research and Development Global Change Research Program (GCRP) works to build the capacity of EPA program and regional offices, water managers, and other decision-makers to assess and respond to global change impacts on water quality and aquatic ecosystems. Research and assessment activities in the GCRP Water Quality focus area broadly support EPA's mission and responsibilities as defined by the Clean Water Act and the Safe Drinking Water Act.

During the last century, much of the U.S. experienced climate change including warming temperatures, increases in precipitation, and increases in the intensity of precipitation events. On top of these large scale shifts are regional and local changes in land use and land cover from urbanization that can also greatly impact urban watersheds. These can interact to yield complex responses on urban water quantity and quality through pulse events, drying/wetting processes, as well as urban practices related to green-spaces (e.g. what is planted and how is it managed).

The potential effects of climate change on watershed hydrology are increasingly well documented. Climate change will have dramatic impacts on water resources, altering precipitation in terms of the amount, timing, and type (e.g. rain versus snow). Increasing air temperature will increase evapotranspiration and possibly net primary productivity in many ecosystems, further affecting water balances locally and regionally. Much less is known about how local and meso-scale decisions in urban and urbanizing areas will interact with these biophysical phenomena to impact water resources. Together, these drivers will lead to numerous cascading effects on water quality, aquatic habitat, and water supply.

The primary method to control urban stormwater is the use of best management practices (BMPs) Traditional grey stormwater infrastructure generally uses single-purpose, hard structures including detention basins and storm sewers to dispose of rainwater. Green infrastructure uses vegetation and soil to manage rainwater where it falls. Green Infrastructure (GI) provides many ecosystem services to city dwellers, including reduced heat loads for human health and reduced energy demand, stormwater infiltration and retention, carbon and nitrogen sequestration, and habitat for biodiversity. Municipalities are getting more and more interested in integrating GI into their traditional "grey" infrastructure because of (1) co-benefits provided that grey infrastructure cannot provide, (2) cost savings, and (3) the flexibility that green infrastructure provides versus grey.

This Work Assignment is for developing a design guide for green and grey stormwater controls that identifies regionally relevant factors that affect urban stormwater control efficiencies given the interaction of climate driven changes (e.g., temperature, precipitation, extreme events) with other changes (e.g., land use change), and methods for adjusting or changing designs to maintain efficiencies. Key objectives of this effort are to (1) review the scientific and grey literature to identify key variables that affect green and grey infrastructure performance, including climate variability and change, and how those key variables change across the country using a relevant categorization scheme, (2) where possible, develop response curves for identified key variables and storm size, (3) develop an urban stormwater vulnerability and design guide that brings together information on key variables, response curves (or thresholds) and climate change to inform modeling and design of urban stormwater BMPs, and (4) prepare written and/or web products for publication.

Potential data sources include case studies and papers that have (1) applied Robust Decision Making to climate change and water quality issues, such as GCRP's case studies on the Patuxent and Illinois rivers, (2) applied the SUSTAIN, RHESSys, BMP-DSS, HydroCAD, SWMM or other relevant models to look explicitly at climate change or to look at other sensitivities in BMP responses due to changes in land use, flow or volume, seasonal variability, or that look at how BMP effectiveness or design changes across a set of locations.

VII. Specific Tasks and Deliverables:

Task 1 – Establish Communication, Prepare Workplan, and Prepare QAPP

SubTask 1.1. Establish communication with the WAM and develop a regular reporting schedule Within 3 days of start date of this WA and over the course of 30 days, the Contractor shall schedule a series of weekly conference calls (not to exceed 1 hour) or at the frequency requested by the WAM, with the WAM and appropriate contractor staff to clarify outstanding questions and confirm the schedule and specific tasks.

In collaboration with the WAM, the Contractor shall also establish a schedule for regular progress reports, project meetings, and other communications throughout the period of performance of this Work Assignment.

Deliverable 1.1.A: Brief, written progress reports as email to the WAM. Due monthly or upon request by the WAM for the duration of this Work Assignment.

Deliverable 1.1.B: Project meetings and other communications, such as conference calls, as needed. Due upon request by the WAM for the duration of this Work Assignment.

Subtask 1.2 Prepare Work Plan and Staffing Plan; Quality Assurance Project Plan (QAPP), if necessary
The Contractor shall have 30 days to prepare a Technical Work Plan describing how the work outlined in this Performance Work Statement will be performed, including deliverables, a schedule, budget, and level of effort. The Contractor shall also prepare a Staffing Plan, which shall be submitted as part of the Work Plan that shows assigned personnel by task and the qualifications of the proposed personnel. The Contractor shall provide expertise in the basic science areas required to complete this work assignment.

The Contractor shall update theQAPP that was approved for WA 1-13, if necessary, and submit it to the WAM and Quality Assurance Manager for approval under this WA. If anything has changed or been added to this Work Assignment related to the use of secondary data from Option Period I to Option Period II, the Contractor must address those changes in the QAPP (e.g., how they are going to consider the use of secondary data to carry out this task). Secondary data are defined as environmental or health data that were developed for a different purpose. This includes data used from citations found in the literature. See these documents: "*EPA Manual C/0 2105-P-01-0: EPA Quality Manual for Environmental Programs*"; "*EPA Requirements for Quality Assurance Project Plans (QA/R-5)*"; and "Appendix A. *Guidance on Quality Assurance Project Plans for Secondary Research Data*." If the scope of work is unchanged from WA 1-13 to this WA, then the QAPP for WA 1-13 shall be acceptable for this WA.

If there are revisions required to the QAPP for WA 1-13, then the updated QAPP shall be submitted 14 days after the approval of the Work Plan. Otherwise, a copy of the approved QAPP for WA 1-13 will be accepted and followed for this WA. The Contractor shall not perform any work on subsequent tasks under this Work Assignment until the Work Plan and QAPP are reviewed and approved.

Deliverable 1.2.A: A draft workplan submitted to the WAM for review. Due 30 days after award.

Deliverable 1.2.B: A final workplan addressing WAM comments on the draft submitted to the WAM for approval. Due 1 week after receiving WAM comments on the draft workplan.

Deliverable 1.2.C: If necessary, update QAPP for WA 1-13 and submit to the WAM for review. Due 14 days after the Work Plan is approved.

Deliverable 1.2.D: If necessary, a final QAPP addressing WAM comments on the draft submitted to the WAM for approval. Due 1 week after receiving WAM comments on the draft QAPP.

Task 2 – Complete development of response curves and design modifications for BMPs; conduct additional model runs of stormwater scenarios

Based on the literature review from work assignment 1-13, the Contractor shall continue using the 20 watersheds output for 5 regions to complete constructing models to examine (1) responses of BMPs by event size and other variables; (2) thresholds in BMP performance, where possible; (3) BMP design alterations or changes that maintain urban stormwater runoff targets based on response curves or thresholds; and (4) tradeoffs and benefits (GI vs. grey infrastructure strategies) including innovative uses of stormwater, to understand implications of choices beyond differences in removal efficiencies (e.g., urban agriculture). To conduct the tradeoffs/benefits analysis (#4 above), the Contractor shall develop more detailed SUSTAIN models for sites within each of the 5 regions, and shall add 1 or 2 more sites within those regions as well as 1 more practice-based scenario to facilitate exploration of an incremental approach to adaptation. The Contractor shall refine the current coarse evaluation of economic costs of alternative stormwater strategies by providing more detailed life cycle (design/build/O&M) costs of options associated with model scenarios for comparison. This shall be used in the cost / tradeoff analysis of grey and green infrastructure for adaptation. Finally, the Contractor shall identify gaps in knowledge that were revealed while carrying out (1) through (4) above. Findings from this task and work assignment 1-13 shall be compiled into an article suitable for publication in a peer-reviewed journal.

Deliverable 2.A. Draft memo with list of additional sites and practice-based scenario. Due 2 weeks after workplan approval.

Deliverable 2.B. Draft memo with results from steps 1-4 above, including additional sites and practice-based scenario. Due 8 weeks after deliverable 2.A.

Deliverable 2.C. Final memo with revisions incorporating comments from WAM. Due 4 weeks after deliverable 2.B.

Deliverable 2.D. Draft article for internal review describing modeling methods and results, including scenarios, response curves, design modifications, and tradeoffs/benefits. Due 8 weeks after Deliverable 2.C.

Deliverable 2.E. Final article for journal submission describing modeling methods and results, including scenarios, response curves, design modifications, and tradeoffs/benefits and responses to internal review comments. Due 4 weeks after receiving internal review comments from the WAM.

Task 3 – Complete development of structure for stormwater vulnerability and planning (design) guide
Based on consultations with the WAM and relevant EPA Program and Regional offices, the Contractor shall complete a structure for the stormwater vulnerability and planning (design) guide that incorporates information from Tasks 2 and WA 1-13. The structure should address the significance and treatment of key variables for both modeling and design of stormwater BMPs. The guide shall accommodate variations in degree of knowledge, transferability, and generalizability across and within the classification system chosen. In other words, the structure needs to be flexible to accommodate variations in information across municipalities, climate change, and geomorphology.

The Contractor shall explore the specific format of the guide, e.g., completely web-based vs. downloadable guidebook, or some combination thereof. The Contractor shall include considerations about the ease of updating the guide with new information.

Deliverable 3.A: Meeting (half-day, in person) with WAM and relevant EPA stakeholders to develop draft proposal for guide structure and format. Due within 2 weeks of WAM's acceptance of Deliverable 2.C.

Deliverable 3.B: Draft structure and format of guide based on Deliverable 3.A. Due 2 weeks after Deliverable 3.A.

Deliverable 3.C: Tele- or web-conference with WAM and relevant EPA stakeholders to review and comment on Deliverable 3.B. Due within 2 weeks of receiving comments from WAM on Deliverable 3.B.

Deliverable 3.D: Final structure and format of guide based on Deliverable 3.C. Due 2 weeks after Deliverable 3.C.

Task 4 – Develop content based on structure and format in Task 3

The Contractor shall develop the content based on Tasks 2 and 3 and populate the structure using the format agreed upon in Task 3. Deliverables under this task shall be presented to the WAM and relevant EPA stakeholders (as in Task 3) and revised as necessary before sending the content for internal and external review. The Contractor shall respond to internal and external review of document, provide revised copies, and support limited additional analysis in response to comments or requests for additional detail.

Deliverable 4.A: Draft guide based on final structure of Deliverable 3.D. Due 6 weeks after Deliverable 3.D. Revised guide due 2 weeks after receiving WAM's comments on draft.

Deliverable 4.B: Meeting (in person or tele- or web-conference) with WAM and relevant EPA stakeholders to review Deliverable 4.A. Due within 2 weeks of submitting Deliverable 4.A.

Deliverable 4.C: Internal review draft of guide based on comments received under Deliverable 4.B. Due 2 weeks after Deliverable 4.B.

Deliverable 4.D: Revised guide for external review and document of responses to internal review comments. Due 4 weeks after receipt of internal review comments from WAM.

Deliverable 4.E: Revised guide for final publication and document of responses to external review comments. Due 4 weeks after receipt of external review comments from WAM.

Task 5: Produce trade journal article on Guide

The contractor shall find a suitable trade publication with professional audience(s) engaged in all components of stormwater management to facilitate communication about the guide and promote its availability and use online.

Deliverable 5.A. Draft trade journal article. Due 2 weeks after Deliverable 4.C.

Deliverable 5.B. Final trade journal article for submission and responses to WAM's comments. Due 2 weeks after receiving internal review comments from the WAM.

VIII. Schedule of Milestones and Deliverables:

Task No.	DELIVERABLE	Schedule
1	1.1.A. Progress reports	Due monthly
1	1.1.B. Other communication	Due upon request by the WAM
1	1.2.A. Draft workplan	Due 30 days after award
1	1.2.B. Final workplan	Due 1 week after receiving WAM comments
1	1.2.C. Draft QAPP	Due 30 days after award
1	1.2.D. Final QAPP	Due 1 week after receiving WAM comments
2	2.A. Overview memo of literature review results	Due 4 weeks after workplan approval
2	2.B. Draft intro and methods memo	Due 4 weeks after Deliverable 2.A.
2	2.C. Final intro and methods memo	Due 2 weeks after receiving WAM comments
3	3.A. Draft and final memo	Draft due 4 weeks after Deliverable 2.C. Final due 2 weeks after receiving WAM comments
3	3.B. Conference call	Due 1 week after Deliverable 3.A.
3	3.C. Draft article	Due 8 weeks after Deliverable 3.B.
3	3.D. Final article	Due 4 weeks after receiving internal review comments
4	4.A. Half-day Meeting on guide structure and format	Due 2 weeks after Deliverable 3.D.
4	4.B. Draft structure and format for Guide	Due 2 weeks after Deliverable 4.A.
4	4.C. Tele-/web-conference	Due 2 weeks after receiving WAM comments on 4.B.
5	4.D. Final structure and format for Guide	Due 2 weeks after Deliverable 4.C.
5	5.A. Draft Guide	Due 6 weeks after Deliverable 4.D.

5	5.B. Meeting	Due 2 weeks after Deliverable 5.A.
5	5.C. Internal review draft Guide	Due 2 weeks after Deliverable 5.B.
5	5.D. External review draft Guide	Due 4 weeks after receipt of internal review comments
5	5.E. Final Guide	Due 4 weeks after receipt of external review comments

IX. Acceptance Criteria:

The Contractor shall prepare high quality deliverables. The Deliverables shall be edited for grammar, spelling, and logic flow. The technical information shall be reasonably complete and presented in a logical, readable manner. Figures submitted shall be of high quality similar to presentations developed for national scientific forums and should be formatted as jpeg or png files. Text deliverables shall be provided in Microsoft Word 2007 or compatible format.

X. Conflict of Interest:

The Contractor warrants that, to the best of the Contractor's knowledge and belief, that there are no relevant facts or circumstances which could give rise to a conflict of interest, as defined in FAR subpart 9.5, or that the Contractor has disclosed all such relevant information.

The Contractor agrees to notify the Contracting Officer immediately, that to the best of its knowledge and belief, no actual or potential conflict of interest exists or to identify to the Contracting Officer any actual or potential conflict of interest the Contractor may have.

The Contractor agrees that if an actual or potential conflict of interest is identified during the performance, the Contractor shall immediately make a full disclosure in writing to the Contracting Officer. This disclosure shall include a description of actions which the Contractor has taken or proposes to take, after consulting with the Contracting Officer, to avoid, mitigate, or neutralize the actual or potential conflict of interest. The Contractor shall continue performance until notified by the Contracting Officer of any contrary action to be taken.

XI. Management Controls:

1. The EPA will review and provide comments on the Work Plan and QAPP.

2. The EPA will also review and provide comments on subsequent deliverables.

3. The Contractor shall clearly identify itself as an EPA contractor when acting in fulfillment of this contract. No decision-making activities relating to Agency policy, enforcement or future contracting shall take place if the Contractor is present. If the Contractor has a need to meet with Federal employees on-site, then the Contractor personnel shall visibly wear identification in performance of this contract while on-site that will be issued by the Government upon arrival

to the Federal facility.

4. Technical Direction: The WAM is authorized to provide technical direction that clarifies the statement of work as set forth in this work assignment. Before initiating any action under technical direction, the contractor shall ensure that the technical direction falls within the scope of work for this work assignment. The technical direction shall be issued in writing by the WAM within four working days of verbal issuance. This will be forwarded to the PO and CO for their information and necessary actions.

   The WAM/COR is the only person authorized to make changes to this work assignment or contract. The changes must have prior approval from the WAM/COR in writing as an amendment or modification to the work assignment or contract.

   Technical direction includes direction to the contractor that assists the contractor in accomplishing individual tasks deemed appropriate under the Statement of Work, as well as comments and approval of reports and other deliverables

XII. Notice Regarding Guidance Provided Under This Work Assignment:

Guidance by the Contractor is strictly limited to management and analytical support. The Contractor shall not engage in activities of an inherently governmental nature such as the following:

1. Formulation of Agency policy
2. Selection of Agency priorities
3. Development of Agency regulations

Should the Contractor receive any instruction from an EPA staff person that the Contractor ascertains to fall into any of these categories or goes beyond the scope of the contractor or work assignment, the Contractor shall immediately contact the Project Officer or the Contract Specialist.

The Contractor shall also ensure that work under this individual work assignment does not contain any apparent or real personal or organizational conflict of interest. The Contractor shall certify that none exists at the time the work plan is submitted to EPA.

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 2-13

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-12-060	09/30/2012 To 09/29/2015 Base X Option Period Number	

Contractor: TETRA TECH, INC.

Specify Section and paragraph of Contract SOW:

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [X] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 09/30/2014 To 09/29/2015

Comments:

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
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Authorized Work Assignment Ceiling

	Contract Period	Cost/Fee	LOE
	09/30/2012 To 09/29/2015	$0.00	0
This Action:		$121,477.00	1,056
Total:		$121,477.00	1,056

Work Plan / Cost Estimate Approvals

Contractor WP Dated:	10/15/2014	Cost/Fee: $121,477.00	LOE: 1,056
Cumulative Approved:		Cost/Fee: $121,477.00	LOE: 1,056

Work Assignment Manager Name: Susan Julius (Signature) (Date)	Branch/Mail Code: Phone Number: 703-347-8619 FAX Number:
Project Officer Name: Sharon Boyde (Signature) (Date)	Branch/Mail Code: Phone Number: 703-347-8576 FAX Number: 703-374-8696
Other Agency Official Name (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Mark Cranley (Signature) 10/28/14 (Date)	Branch/Mail Code: CPOM Phone Number: 513-487-2351 FAX Number: 513-487-2109

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 2-14

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-12-060	09/30/2012 To 09/29/2015 Base Option Period Number 2	Phase 2 Modeling/Analysis

Contractor: TETRA TECH, INC.

Specify Section and paragraph of Contract SOW: 2e

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 09/30/2014 To 09/29/2015

Comments:

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

SFO (Max 2): ☐

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period:	Cost/Fee:	LOE:
09/30/2012 To 09/29/2015		
This Action:		
Total:		

Work Plan / Cost Estimate Approvals

Contractor WP Dated:	Cost/Fee:	LOE:
Cumulative Approved:	Cost/Fee:	LOE:

Work Assignment Manager Name: Thomas Johnson (Signature) (Date)	Branch/Mail Code: Phone Number: 703-347-8618 FAX Number:
Project Officer Name: Sharon Boyde (Signature) (Date)	Branch/Mail Code: Phone Number: 703-347-8576 FAX Number: 703-374-8696
Other Agency Official Name (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Mark Cranley (Signature) 09/12/14 (Date)	Branch/Mail Code: Phone Number: 513-487-2351 FAX Number: 513-487-2109

Performance Work Statement
Tetra Tech, Inc.
Contract EP-C-12-060
Work Assignment No. 2-14

I. Title: Phase 2 Modeling and Analysis of Climate Change Effects on Urban Green Infrastructure Performance

II. Period of Performance: Award through Sept 29, 2015

III. COR:
Thomas Johnson, Ph.D.
U.S. Environmental Protection Agency
Office of Research and Development
National Center for Environmental Assessment (8601-P)
1200 Pennsylvania Avenue, NW
Washington, DC 20460
703-347-8618 (phone)
703-347-8694 (fax)
johnson.thomas@epa.gov

Alternate COR:
Christopher Clark, Ph.D.
U.S. Environmental Protection Agency
Office of Research and Development
National Center for Environmental Assessment (8601-P)
1200 Pennsylvania Avenue, NW
Washington, DC 20460
703-347-8665
clark.christopher@epa.gov

V. Introduction:
The EPA Office of Research and Development Global Change Research Program (GCRP) works to build the capacity of EPA program and regional offices, water managers, and other decision-makers to assess and respond to global change impacts on water quality and aquatic ecosystems. Research and assessment activities in the GCRP Water Quality focus area broadly support EPA's mission and responsibilities as defined by the Clean Water Act and the Safe Drinking Water Act.

The potential effects of climate change on watershed hydrology are increasingly well documented. Climate change will have dramatic impacts on water resources, altering precipitation in terms of the amount, timing, and type (e.g. rain versus snow). Little is known, however, about how local and meso-scale decisions in urban and urbanizing areas will interact with these biophysical phenomena to impact water resources. Together, these drivers will lead to numerous cascading effects on water quality, aquatic habitat, and water supply.

The primary method to control urban stormwater is the use of best management practices (BMPs). Traditional grey stormwater infrastructure generally uses single-purpose, hard structures including detention basins and storm sewers to dispose of rainwater. Green infrastructure (GI) uses vegetation and soil to manage rainwater where it falls. Green Infrastructure provides many additional ecosystem services

to city dwellers, including reduced heat loads for human health and reduced energy demand, carbon and nitrogen sequestration, and habitat for biodiversity.

Work was initiated during Option Year 1 of this contract to conduct dynamic modeling to examine the potential effects of climate change on urban stormwater management using GI. Tasks completed during Option Year 1 include (1) conducting a review the scientific literature concerning the performance of different GI practices and their sensitivity to climate variability and change, (2) development of a set of urban archetypes (AUSs) representing a range of density patterns and GI practices for simulation modeling, and (3) setup of the RHESSys model for simulation of AUSs under a range of baseline climate and potential climate change conditions.

This Work Assignment is for continuing analyses of the potential effects of climate change on urban stormwater management using GI. Key tasks include (1) simulation modeling using the RHESSys model to establish the baseline performance of GI practices in different urban settings (AUSs) under a range of baseline climate conditions representative of different U.S. cities, (2) evaluation of how GI performance will change under future climate change conditions, (3) and data analyses and preparation of 2 written manuscripts based on modeling results for publication in peer reviewed journals.

Related and Supporting GCRP Projects

EPA has developed mid-21st century climate change and urban and residential development scenarios that are available but not required for use in this project. Other sources of climate scenarios are easily available. Final selection of scenarios will be determined in consultation with the COR. Existing scenarios available from EPA are described below.

The EPA GCRP has partnered with the North American Regional Climate Change Assessment Project (NARCCAP), which. NARCCAP provides detailed scenarios of regional climate change over the U.S. in a form suitable for driving basin-scale hydrologic models and for use in impacts assessments. More information about NARCCAP can be found at http://www.narccap.ucar.edu/. In addition to NARCCAP, other existing scenarios are available from four the Coupled Model Intercomparison Project Phase 3 (CMIP3) data (served at http://gdo-dcp.ucllnl.org/downscaled_cmip3_projections/). These scenarios are downscaled using bias-corrected and spatially downscaled (BCSD) techniques.

Land use scenarios are available from EPA's Integrated Climate and Land Use Scenarios (ICLUS) project. ICLUS has developed seamless, national-scale land use change scenarios compatible with the IPCC emissions storylines underlying NARCCAP and other GCM climate change projections. ICLUS provides decadal projections of changes in housing density and impervious cover throughout the contiguous U.S. through the year 2100.

VI. Specific Tasks and Deliverables – Option Year 2:

Task 1 – Prepare Workplan, Establish Communication, and Prepare QAPP

SubTask 1.1. Prepare Work Plan and Cost Estimate

The Contractor shall prepare a work plan in response to this work assignment, outlining the proposed approach, expertise and staffing, and resources needed, and a schedule to complete each task. The work plan should identify potential data and tools needed and any potential problems that might be encountered during the execution of the work assignment.

SubTask 1.2. Establish communication with the COR and develop a regular reporting schedule

The Contractor shall contact the COR and schedule a kickoff project meeting. In collaboration with the COR the Contractor shall also establish a schedule for regular progress reports, project meetings, and other communications throughout the period of performance of this Work Assignment.

Deliverable 1.2.A: Brief, written progress reports as email to the COR. Due monthly or upon request by the COR for the duration of this Work Assignment.

Deliverable 1.2.B: Project meetings and other communications, such as conference calls, as needed. Due upon request by the COR for the duration of this Work Assignment.

SubTask 1.3. Develop a QAPP

All work conducted under this Work Assignment shall be performed pursuant to an EPA approved Quality Assurance Project Plan (QAPP). The contractor shall develop a Quality Assurance Project Plan within 30 days after project start for review and approval by the TOM and the EPA QA Officer. The QAPP can be based directly on the previously approved QAPP developed for WA 1-14 in Option Year 1. The QAPP shall outline the approach and measures the Contractor will implement to ensure a high standard of quality in data analysis and written deliverables. The QAPP shall be in conformance with EPA's *Requirements for Quality Assurance Project Plans* (EPA QA/R-5). Portions of this Work Assignment relevant to modeling will reference *Guidance for Quality Assurance Project Plans for Modeling* (EPA QA/G-5M), while portions of this Work Assignment relevant to geospatial data will reference *Guidance for Quality Assurance Project Plans for Geospatial Data* (EPA QA/G-5G). Elements from these sources will be used to derive a single QAPP for this Work Assignment.

Deliverable 1.3.A: QAPP for this WA. Due to the COR 2 weeks after award.

Task 2 - Simulation Modeling to Assess Performance of Urban GI under current and future conditions

The Contractor shall conduct simulation modeling using the RHESSys model to assess the performance of urban subunits (AUSs) to current and future climate and management conditions. The Contractor will use a modeling framework capable of analyzing effects from different types of land use on water resources and biogeochemistry of urban watersheds (e.g. RHESSys, http://fiesta.bren.ucsb.edu/~rhessys/). The number and type of simulations conducted will follow the Analysis Design Memo prepared by the Contractor and approved by the COR under WA 1-14 in Option Year 1 of this contract.

Subtask 2.1. Complete model set-up, calibration, validation and baseline simulations under current climate conditions

The Contractor shall acquire all necessary input data, setup, calibrate (if necessary) and validate the RHESSys model. The Contractor shall also conduct baseline model simulations of GI performance in the different AUSs under current/historical climate conditions.

Deliverable 2.1.A. Results of simulation modeling in MS Excel format. Due 4 weeks after award.

Subtask 2.2. Conduct model simulations under future climate conditions and management strategies

The Contractor shall run the RHESSys simulations described in Analysis Design Memo approved by the COR in WA 1-14 in Option Year 1 of this contract. The Contractor shall also prepare summary statistics and conduct other data analysis to characterize the results from the simulations.

Deliverable 2.2.A. Results of simulation modeling in MS Excel format. Due 8 weeks after approval of Deliverable 2.1.A.

Deliverable 2.2.B. Brief presentation (30-45 min) giving an overview of simulation modeling results in .ppt or .pdf format. Due 2 weeks after approval of Deliverable 2.2.A.

Subtask 2.3. Conduct simulations and/or analyses as needed to support a second manuscript

In consultation with the COR, the Contractor shall propose an analysis topic and supporting analysis plan for a second manuscript for publication in a peer reviewed journal. Two potential topics include interpolating simulation results based on urban archetypes to existing U.S. cities, and more detailed exploration of barriers and opportunities for implementing GI to adapt stormwater to climate change. Other topics are possible. Analysis to support the second manuscript could potentially include new simulations and/or statistical analyses. Final selection of an appropriate and feasible topic and analysis will be made in consultation with the COR. Following approval by the COR, the Contractor shall complete the proposed analyses and present a written summary of simulation and/or other analysis results to the COR.

Deliverable 2.3.A. Memo describing proposed simulations and/or analyses to support a second manuscript. Due 2 weeks after approval of Deliverable 2.2.A.

Deliverable 2.3.B. Results of simulation modeling and/or analyses in MS Excel or other appropriate format. Due 8 weeks after approval of Deliverable 2.3.A.

Task 3. Prepare 2 Written Manuscripts for Submittal to Journal for Publication

The Contractor shall prepare written manuscripts describing the motivation, methodology and results, and conduct data analysis as necessary to complete 2 manuscripts for submission to peer reviewed journals for publication.

SubTask 3.1. Prepare a written manuscript based on RHESSys modeling results describing the potential effects of climate change on urban stormwater management using GI.

In consultation with the WAM, the Contractor shall prepare a written manuscript (approximately 20-30 single-spaced pages excluding figures/tables) discussing the potential effects of climate change on urban stormwater management for different urban archetypes (AUSs) and GI practices. The manuscript shall be written in the format of a peer reviewed scientific journal to be specified by the COR, and be written in clear, concise prose consistent with the standards of peer reviewed scientific literature. The Contractor shall prepare a first draft manuscript and submit to the COR for review. The Contractor shall revise the first draft to address COR comments and submit a second and final draft to the COR for approval.

Deliverable 3.1.A: A first draft manuscript discussing the potential effects of climate change on urban stormwater management for different AUSs submitted to the COR for review. Due 4 weeks after approval of Deliverable 2.2.A.

Deliverable 3.1.B: A second draft manuscript addressing COR comments on the first draft submitted to the COR. Due 4 weeks after receiving COR comments on Deliverable 3.1.A.

SubTask 3.2. Prepare a written manuscript on a topic selected in consultation with the COR building on the results presented in Task 3.1.

In consultation with the COR, the Contractor shall prepare a written manuscript (approximately 20-30 single-spaced pages excluding figures/tables) on a topic selected in consultation with the COR. Two potential topics for this analysis and manuscript include interpolating simulation results based on urban archetypes to existing U.S. cities, and more detailed exploration of barriers and opportunities for implementing GI to adapt stormwater to climate change. Other topics are possible. The manuscript shall be written in the format of a peer reviewed scientific journal to be specified by the COR, and be written in clear, concise prose consistent with the standards of peer reviewed scientific literature. The Contractor shall prepare a first draft manuscript and submit to the COR for review. The Contractor shall revise the first draft to address COR comments and submit a second and final draft to the COR for approval.

Deliverable 3.2.A: A first draft manuscript on a topic selected in consultation with the COR submitted to the COR for review and approval. Due 4 weeks after approval of Deliverable 2.3.B.

Deliverable 3.2.B: A second draft manuscript addressing COR comments on the first draft submitted to the COR. Due 4 weeks after receiving COR comments on Deliverable 3.2.A.

SubTask 3.3: Provide electronic files of all model setup, input and simulation output

The Contractor shall provide to the COR electronic copies of all model setup, model input, and simulation output files generated in this project on a memory stick or external hard drive. Files shall be organized in a directory structure approved by the COR.

Deliverable 3.3.A. Electronic copies of all model setup, model input, and simulation output files generated in this project on a memory stick or external hard drive. Due 8 weeks after completion of Deliverable 3.2.B.

Task 4. Secure publishing rights for page fees and open access fees for 2 manuscripts completed under this Work Assignment.

Two manuscripts completed under this WA will be published in peer reviewed scientific journals, (1) Potential effects of climate change on urban stormwater management using GI, and (2) A topic to be determined in consultation with the COR. The Contractor shall pay the publisher of each manuscript publication page fees and fees for open access for each of these manuscripts.

VII. Schedule of Milestones and Deliverables:

TASK	DELIVERABLE	SCHEDULE
1	1.2.A. Progress reports	Due monthly
1	1.2.B. Other communication	Due upon request by the COR

1	1.3.A. QAPP	Due 2 weeks after award
2	2.1.A. Setup and historical simulation results	Due 4 weeks after award
2	2.2.A. Future simulation results	Due 8 weeks after Deliverable 2.1.A
2	2.2.B. Presentation on simulation results	Due 2 weeks after Deliverable 2.2.A
2	2.3.A. Analysis design second manuscript	Due 2 weeks after Deliverable 2.2.A
2	2.3.B. Analysis results second manuscript	Due 8 weeks after Deliverable 2.3.A
3	3.1.A. Draft - Sensitivity manuscript	Due 4 weeks after Deliverable 2.2.A
3	3.1.B. Final – Sensitivity manuscript	Due 4 weeks after Deliverable 3.1.A
3	3.2.A. Draft - Second manuscript	Due 4 weeks after Deliverable 2.3.B
3	3.2.B. Final – Second manuscript	Due 4 weeks after Deliverable 3.2.A
3	3.3.A. Provide model files on hard drive	Due 8 weeks after Deliverable 3.2.B

VIII. Acceptance Criteria:

The Contractor shall prepare high quality deliverables. The Deliverables shall be edited for grammar, spelling, and logic flow. The technical information shall be reasonably complete and presented in a logical, readable manner. Figures submitted shall be of high quality similar to presentations developed for national scientific forums and should be formatted as jpeg or png files. Text deliverables shall be provided in Microsoft Word 2007 or compatible format.

IX. Conflict of Interest:

The Contractor warrants that, to the best of the Contractor's knowledge and belief, that there are no relevant facts or circumstances which could give rise to a conflict of interest, as defined in FAR subpart 9.5, or that the Contractor has disclosed all such relevant information.

The Contractor agrees to notify the Contracting Officer immediately, that to the best of its knowledge and belief, no actual or potential conflict of interest exists or to identify to the Contracting Officer any actual or potential conflict of interest the Contractor may have.

The Contractor agrees that if an actual or potential conflict of interest is identified during the performance, the Contractor shall immediately make a full disclosure in writing to the Contracting Officer. This disclosure shall include a description of actions which the Contractor has taken or proposes to take, after consulting with the Contracting Officer, to avoid, mitigate, or neutralize the actual or

potential conflict of interest. The Contractor shall continue performance until notified by the Contracting Officer of any contrary action to be taken.

X. Management Controls:

1. The EPA will review and provide comments on the Work Plan and QAPP.

2. The EPA will also review and provide comments on subsequent deliverables.

3. The Contractor shall clearly identify itself as an EPA contractor when acting in fulfillment of this contract. No decision-making activities relating to Agency policy, enforcement or future contracting shall take place if the Contractor is present. If the Contractor has a need to meet with Federal employees on-site, then the Contractor personnel shall visibly wear identification in performance of this contract while on-site that will be issued by the Government upon arrival to the Federal facility.

4. Technical Direction: The WAM is authorized to provide technical direction that clarifies the statement of work as set forth in this work assignment. Before initiating any action under technical direction, the contractor shall ensure that the technical direction falls within the scope of work for this work assignment. The technical direction shall be issued in writing by the WAM within four working days of verbal issuance. This will be forwarded to the PO and CO for their information and necessary actions.

   The WAM/COR is the only person authorized to make changes to this work assignment or contract. The changes must have prior approval from the WAM/COR in writing as an amendment or modification to the work assignment or contract.

   Technical direction includes direction to the contractor that assists the contractor in accomplishing individual tasks deemed appropriate under the Statement of Work, as well as comments and approval of reports and other deliverables

XI. Notice Regarding Guidance Provided Under This Work Assignment:

Guidance by the Contractor is strictly limited to management and analytical support. The Contractor shall not engage in activities of an inherently governmental nature such as the following:

1. Formulation of Agency policy
2. Selection of Agency priorities
3. Development of Agency regulations

Should the Contractor receive any instruction from an EPA staff person that the Contractor ascertains to fall into any of these categories or goes beyond the scope of the contractor or work assignment, the Contractor shall immediately contact the Project Officer or the Contract Specialist.

The Contractor shall also ensure that work under this individual work assignment does not contain any apparent or real personal or organizational conflict of interest. The Contractor shall certify that none exists at the time the work plan is submitted to EPA.

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 2-14

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-12-060	09/30/2012 To 09/29/2015	Phase 2 Modeling/Analysis
	Base Option Period Number 2	

Contractor: TETRA TECH, INC.

Specify Section and paragraph of Contract SOW:

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [X] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 09/30/2014 To 09/29/2015

Comments:

[ ] Superfund — Accounting and Appropriations Data — [X] Non-Superfund

SFO (Max 2): [ ]

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

	Cost/Fee:	LOE:
Contract Period: 09/30/2012 To 09/29/2015	$0.00	0
This Action:	$92,255.00	849
Total:	$92,255.00	849

Work Plan / Cost Estimate Approvals

	Cost/Fee:	LOE:
Contractor WP Dated: 10/15/2014	$92,255.00	849
Cumulative Approved:	$92,255.00	849

Work Assignment Manager Name: Thomas Johnson (Signature) (Date)	Branch/Mail Code: Phone Number: 703-347-8618 FAX Number:
Project Officer Name: Sharon Boyde (Signature) (Date)	Branch/Mail Code: Phone Number: 703-347-8576 FAX Number: 703-374-8696
Other Agency Official Name (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Mark Cranley (Signature) 10/28/14 (Date)	Branch/Mail Code: CPOD Phone Number: 513-487-2351 FAX Number: 513-487-2109

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 2-14

☐ Other ☒ Amendment Number: 000001

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-12-060	09/30/2012 To 09/29/2015 Base Option Period Number 2	Phase 2 Modeling and Analysis

Contractor	Specify Section and paragraph of Contract SOW
TETRA TECH, INC.	2b

Purpose:
- ☐ Work Assignment
- ☒ Work Assignment Amendment
- ☐ Work Plan Approval
- ☐ Work Assignment Close-Out
- ☐ Incremental Funding

Period of Performance: From 09/30/2014 To 09/29/2015

Comments:

☐ Superfund — Accounting and Appropriations Data — ☒ Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period:	Cost/Fee:	LOE:
09/30/2012 To 09/29/2015		
This Action:		
Total:		

Work Plan / Cost Estimate Approvals

	Cost/Fee:	LOE:
Contractor WP Dated:		
Cumulative Approved:		

Work Assignment Manager Name: Thomas Johnson (Signature) (Date)		Branch/Mail Code: Phone Number: 703-347-8618 FAX Number:
Project Officer Name: Ruth Corn (Signature) (Date)		Branch/Mail Code: Phone Number: 513-569-7920 FAX Number:
Other Agency Official Name (Signature) (Date)		Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: Mark Cranley (Signature)	6/06/15 (Date)	Branch/Mail Code: CPOD Phone Number: 513-487-2351 FAX Number: 513-487-2109

Work Assignment Form. (WebForms v1.0)

Performance Work Statement
Tetra Tech, Inc.
Contract EP-C-12-060
Work Assignment 2-14
Amendment 1

I. **Title:** MODIFICATION 1: Phase 2 Modeling and Analysis of Climate Change Effects on Urban Green Infrastructure

II. Period of Performance: Award through September 29, 2015

III. Work Assignment Manager:
Thomas Johnson, PhD
U.S. Environmental Protection Agency
Office of Research and Development
National Center for Environmental Assessment (8601-P)
1200 Pennsylvania Avenue, NW
Washington, DC 20460
703-347-8618 (phone)
703-347-8694 (fax)
johnson.thomas@epa.gov

Alternate COR:
Christopher Clark, PhD
U.S. Environmental Protection Agency
Office of Research and Development
National Center for Environmental Assessment (8601-P)
1200 Pennsylvania Avenue, NW
Washington, DC 20460
703-347-8665
Clark.christopher@epa.gov

IV. Total Estimated LOE: 284 hours

V. Tasks and Deliverables:

Task M-1. Develop and apply additional analyses to map RHESSys simulation results for urban archetypes to real U.S. cities

Under WA 2-14, Task 2 (existing), the Contractor will conduct simulation modeling with RHESSys to assess the performance of urban GI in different urban archetypal settings (AUS's) under current and future climatic conditions. Under Task 3 of this WA (existing), the Contractor shall prepare 2 written manuscripts to be submitted for publication in peer reviewed journals. The first manuscript will be based on simulation results for urban archetypes. The second will involve an application or mapping of archetype simulation results to real U.S. cities. Mapping results to real cities is attractive as it would provide a way to translate findings of this study to real world situations and potentially inform planning

efforts by local governments. A relatively simple approach involving aggregation of multiple archetypal units to represent real cities was envisioned.

Recent work has identified additional analyses that provide a more rigorous and informative methodology for mapping archetype results to real cities. The process is both more granular (in terms of unit area land use/soil type elements, not assembled AUSs) and takes the form of conditional responses: e.g., if climate does this, than "regional" GI performance will be altered in these ways. Inferences can be extended to different real city layouts based on performance of individual unit-area sources and the degree of treatment of impervious surface runoff provided by different types of GI.

This Task (new) is to develop and apply additional analyses to map RHESSys simulation results for urban archetypes to real U.S. cities. The Contractor shall, in consultation with the COR, develop and test new analyses and approaches for mapping simulation results for urban archetypal units to real U.S. cities. After developing the approach, the Contractor will apply the approach to selected cities or regions within the U.S. The results of this analysis shall subsequently be used to complete a manuscript focused mapping of archetype simulation results to real U.S. cities to be submitted for publication in a peer reviewed journal (as described in WA 2-14, SubTask 3.2).

> *Deliverable M-1.A:* Memo describing proposed new analyses and approach for mapping archetype simulations to real cities. Due to the COR for approval 2 weeks after approval of WA 2-14, Deliverable 2.2.A.
>
> *Deliverable M-1.B:* Results of application of analyses and approach in MS Excel, ArcGIS or other appropriate format. Due 8 weeks after approval of Deliverable M-1.A.

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 2-14

[X] Other [X] Amendment Number: 000001

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-12-060	09/30/2012 To 09/29/2015 Base Option Period Number 2	Phase 2 Modeling & Analysis

Contractor	Specify Section and paragraph of Contract SOW
TETRA TECH, INC.	2b

Purpose:
- [ ] Work Assignment
- [X] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 09/30/2014 To 09/29/2015

Comments:
Full title:Phase 2 Modeling & Analysis of Climate Change on Urban Green Infrastructure

[ ] Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (*Max 2*) [ ]

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

	Cost/Fee:	LOE:
Contract Period: 09/30/2012 To 09/29/2015	$0.00	0
This Action:	$0.00	0
Total:	$131,255.00	1,163

Work Plan / Cost Estimate Approvals

	Cost/Fee:	LOE:
Contractor WP Dated: 01/21/2015	$0.00	0
Cumulative Approved:	$131,255.00	1,163

Work Assignment Manager Name Thomas Johnson	(Signature)	(Date)	Branch/Mail Code: Phone Number 703-347-8618 FAX Number:
Project Officer Name Ruth Corn	(Signature)	(Date)	Branch/Mail Code: Phone Number: 513-569-7920 FAX Number:
Other Agency Official Name	(Signature)	(Date)	Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name Mark Cranley	(Signature)	01/30/15 (Date)	Branch/Mail Code: CPOD Phone Number: 513-487-2351 FAX Number: 513-487-2109